Application S/N: 10/099,623 **Date of Response: June 17, 2005**
Atty Docket No. 1014-15

AMENDMENTS TO THE SPECIFICATION

Please replace the Abstract with the following amended Abstract:

An apparatus and method for fabricating fiber gratings from optical fibers by imposing constant or variable chiral refractive index modulation along an optical fiber. The refractive index modulation may be of single helix symmetry ~~to produce a fiber grating enabling different propagation speed of signals with the same handedness as the structure with respect to signals with opposite handedness as the structure at a wavelength substantially equal to the pitch of the single helix~~, or of double helix symmetry to produce a chiral fiber Bragg grating. In several embodiments of the present invention the refractive index modulation is imposed by twisting and moving a specially prepared optical fiber through a heater that heats a small region of the fiber to a temperature sufficient to allow the fiber to twist in that region as it moves through the heater. ~~Alternately, a normal optical fiber may specially prepared for use with the apparatus of the present invention at a pre-process stage prior to twisting and heating. In other embodiments of the inventive apparatus, the refractive index modulation is imposed by cutting one or more helical groove patters into a normal optical fiber, or by wrapping a normal fiber with one or more elongated dielectric fibers of a smaller diameter than the optical fiber in one or more helical patterns.~~ Advantageously, the fabrication of the chiral fiber grating may be monitored and the fabrication parameters automatically adjusted to ensure that the chiral fiber grating meets desired requirements.

On page 26 of the specification, please replace the paragraph that starts with "Referring now to FIG. 3, a second embodiment..." with the following amended paragraph:

> Referring now to FIG. 3, a second embodiment of the fabrication apparatus 10 of FIGs. 1A and 1B is shown as a fabrication apparatus 200. The fabrication apparatus includes a first process stage 202, corresponding to the first process stage 12 of FIGs. 1A, 1B, and substantially similar to the first process stage 102 of FIG. 2, a ~~third~~ second process stage 206, corresponding to the second process stage 16 of FIGs. 1A, 1B, and a third process stage 204, corresponding to the third process stage 14 of FIGs. 1A, 1B, and substantially similar to the third process stage 104 of FIG. 2. The fabrication apparatus 200 is shown during the fabrication process where an unprocessed optical fiber section 214 is shown above the third process stage 204, and the processed chiral fiber grating 218 is shown below the third process stage 204. It should be noted that prior to the fabrication process the chiral fiber grating 218 is not yet formed and thus the optical fiber 214 extends through the third process stage 204 and into the second process stage 206 (not shown).

On page 4 of the specification, please replace the paragraph that starts with "One novel approach that addressed the problems in fabrication techniques of previously known fiber gratings ..." with the following amended paragraph:

> One novel approach that addressed the problems in fabrication techniques of previously known fiber gratings is disclosed in the commonly-assigned co-pending U.S. patent application, S/N: 10/020,678, entitled "Apparatus and Method for Manufacturing Chiral Fiber Bragg Gratings". This technique involved imposing a chiral modulation of the refractive index at the core of a UV sensitive fiber utilizing one or more independent UV beams during motion and rotation of the fiber with respect to the one or more UV beams. While this technique produces superior results it requires the use of UV-sensitive fibers and is thus limited to certain applications.

having a desired refractive index profile, a preform fiber with specific characteristics would need to be prepared prior to fabrication of the chiral fiber. Finally, the [[FTS]] FTT technique relied on heating the fiber while it is being twisted – it did not address fabrication of chiral fibers having the properties of fiber gratings without heating or twisting the fiber.

On page 15 of the specification, please replace the paragraph that starts with "Because CLCs exhibit superior properties in comparison to layered media (as disclosed in ..." with the following amended paragraph:

> Because CLCs exhibit superior properties in comparison to layered media (as disclosed in commonly assigned ~~co-pending~~ U.S. patent No. 6,404,789 ~~application~~ entitled "Chiral Laser Apparatus and Method"), it would be advantageous to implement the essence of a cholesteric periodic photonic band gap (hereinafter "PBG") structure in an optical fiber. This approach captures the superior optical properties of CLCs while facilitating the manufacture of the structure as a continuous (and thus easier to implement) process.

On page 16 of the specification, please replace the paragraph that starts with "Several embodiments of such advantageous double and single helix structures ..." with the following amended paragraph:

> Several embodiments of such advantageous double and single helix structures in optical fibers are disclosed in the commonly assigned ~~co-pending~~ U.S. patent No. 6,839,486 ~~application~~ entitled "Chiral Fiber Grating" which is incorporated by reference herein in its entirety.

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On page 16 of the specification, please replace the paragraph that starts with "Referring now to FIGS. 1A-12, the various embodiments of the inventive fiber grating ..." with the following amended paragraph:

> Referring now to FIGS. 1A-12, the various embodiments of the inventive fiber grating fabrication apparatus and additional components thereof may be operated to advantageously produce the various optical fiber gratings shown in FIGS. 13A-19B as well as chirped fiber gratings (not shown), apodized fiber gratings (not shown) that are disclosed in the commonly assigned ~~co-pending~~ U.S. ~~provisional~~ patent No. 6741631 ~~application~~ entitled "Apodized Chiral Fiber Grating" which is incorporated by reference herein in its entirety, and distributed twist chiral fiber gratings (not shown) that are disclosed in the commonly assigned co-pending U.S. ~~provisional patent application entitled "Distributed Twist Chiral Fiber Grating"~~ patent application S/N: 10/389,617, entitled "Extended Chiral Defect Structure Apparatus and Method ", which is incorporated by reference herein in its entirety.

On page 20 of the specification, please replace the paragraph identified as "Example 1: Chiral fiber grating", with the following amended paragraph:

> In this example, the control unit 20 causes a single helix refractive index modulation to be imposed on the optical fiber 18 which results in a fiber grating enabling different propagation speed of signals with the same handedness as the structure with respect to signals with opposite handedness as the structure at a wavelength substantially equal to the pitch of the single helix which in turn results in rotation of the polarization plane of linearly polarized light. Such a fiber grating is particularly

useful in add-drop filers, such as ones disclosed in the ~~co-pending~~ commonly assigned U.S. patent ~~application~~ entitled "Add-Drop Filter Utilizing Chiral Elements" and the ~~co-pending~~ commonly assigned U.S. ~~provisional~~ patent ~~application~~ entitled "Configurable Add-Drop Filter Utilizing Resonant Optical Activity".

On page 21 of the specification, please replace the paragraph identified as "Example 2: Chiral fiber Bragg grating", with the following amended paragraph:

In this example, the control unit 20 causes a double helix refractive index modulation to be imposed on the optical fiber 18 which results in a fiber Bragg grating with a photonic Bang gap. Such a fiber Bragg grating is advantageous for a number of applications such as lasers, sensors and filters. Chiral fiber Bragg gratings are particularly useful in applications disclosed in the following commonly assigned U.S. ~~provisional patent applications~~ patents entitled "Chiral Fiber Laser Apparatus and Method" (U.S. patent No. 6,671,293), "Chiral ~~in Fiber~~ In-Fiber Adjustable Polarizer Apparatus and Method" (U.S. patent No. 6,721,469), and "Chiral Fiber Sensor Apparatus and Method" (U.S. patent No. 6,792,169).

On page 21 of the specification, please replace the paragraph identified as "Example 3: Chirped chiral fiber grating", with the following amended paragraph:

In this example, the control unit 20 causes a refractive index modulation with a varying period to be imposed on the optical fiber 18 which results in a chirped chiral fiber grating having a period that varies along its central longitudinal axis. Chirped

chiral fiber gratings, described in greater detail in the commonly assigned co-pending U.S. ~~provisional~~ patent application S/N: 10/313,447, entitled "Customizable Chirped Chiral Fiber Bragg Grating" are useful in a variety of applications, such as in chromatic dispersion compensators. The varying period of the chirped chiral fiber grating can be achieved by selective control, by the control system 20, of at least one of twisting speed and acceleration and linear speed and acceleration of the optical fiber 18 during the fabrication process.

On page 22 of the specification, please replace the paragraph identified as "Example 4: Apodized chiral fiber grating", with the following amended paragraph:

In this example, the control unit 20 causes increasing grating strength to be imposed in a first section of the optical fiber 18, a constant grating strength modulation to be defined in a sequential second section of the optical fiber 18, and decreasing grating strength to be defined in a sequential third section of the optical fiber 18. This change of the strength of the grating results in an apodized chiral fiber grating described in greater detail in the commonly assigned ~~co-pending~~ U.S. ~~provisional~~ patent No: 6,741,631, ~~application entitled "Customizable Apodized Chiral Fiber Grating"~~ entitled "Customizable Apodized Chiral Fiber Grating Apparatus and Method". The change of the grating strength of the apodized chiral fiber grating can be linear, sinusoidal, or co-sinusoidal and may be achieved by selective control, by the control system 20, of at least one of twisting speed and acceleration and linear speed and acceleration of the optical fiber 18 during the fabrication process.

On page 22 of the specification, please replace the paragraph identified as "Example 5: Distributed chiral twist fiber grating", with the following amended paragraph:

In this example, the control unit 20 causes refractive index modulation to be different between two sections of the chiral fiber grating 24 such that the grating has a first section of a first pitch, a second section of a second pitch, and a third section of the first pitch, where the second section comprises a gradual chiral twist of a predetermined angle between the first and third sections thereby forming a distributed chiral twist fiber grating. The distributed chiral twist fiber grating is advantageous over a standard chiral twist structure (disclosed in a commonly assigned ~~co-pending~~ U.S. ~~Patent application~~ patent No. 6,396,859, entitled "Chiral Twist Laser and Filter Apparatus and Method") in that there is a wider energy distribution inside a distributed chiral twist fiber grating doped with an active material. The distributed chiral twist fiber grating is described in greater detail in the above-incorporated commonly assigned co-pending U.S. ~~provisional patent application entitled "Distributed Twist Chiral Fiber Grating"~~ patent application entitled "Extended Chiral Defect Structure Apparatus and Method ". The change in the pitch along the chiral fiber grating and the predetermined angle can be achieved by selective control, by the control system 20, of at least one of twisting speed and acceleration and linear speed and acceleration of the optical fiber 18 during the fabrication process.